Abstract of the Disclosure

An optical amplifier has a spatially varying absorption spectrum formed in a monolithic InGaAsP structure whose quantum well active structure has modified effective bandgap properties. The effective bandgap properties can be modified by rapid thermal annealing to cause the diffusion of defects from one or two InP defect layers into the quantum well active structure. Multiple such optical amplifiers, having their effective bandgap properties modified to provide different gain spectra, can be monolithically formed in a single semiconductor structure for broadband amplification, in which case their individual gain spectra can be controlled to control the total gain spectrum dynamically. Alternatively, the optical amplifier can be used in a Mach-Zehnder wavelength converter for broadband wavelength conversion.